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height, as, for example, Nevado de Famatina (6,024 metres) and Nevada de Aconquija (5,400 m.): toward the south these Pampas sierras diminish in height.

The province of Santa Fe (Argentine Republic), according to the census of June 8, 1887, now contains 220,332 inhabitants, against 187,000 in 1869. The municipality of Córdoba, a square of 26 kilometres on each side, contained in October of the same year 66,247 souls, while in 1869 it had but 34,458. Buenos Ayres has now a population of 424,873, and Rosaria 50,914.

GEOGRAPHICAL NEWS.—ALGERIA.—The last census (1886) of Algeria gives a population of 3,752,196, being an increase of nearly half a million above the population in 1881. Of this increase 24,209 are Frenchmen, and nearly 22,000 natives of other European countries. There has been an influx of more than 17,000 Moroccans into Algeria, while Mohammedan-French subjects have increased from 2,842,497 to 3,264,481.

According to Mr. N. J. Dixon, the population of the various States of Colombia is as follows: Boyaca, 483,874; Cauca, 435,690; Santander, 423,427; Cundinamarca, 409,602; Antioquia, 365,974; Bolivar, 300,000; Tolima, 230,821; Panama, 220,600; and Magdalena, 85,255; making a total of 2,955,243.

GEOLOGY AND PALÆONTOLOGY.

NOTES ON THE ROCKFORD SHALES.—The lithological and palæontological characters of the Rockford shales of Iowa differ considerably at different localities.

For example, the shales which are seen at the south exposure at Owens Grove, Cerro Gordo county, differ conspicuously, in many respects, in their lithological and palæontological characters, from the same beds observed at other localities.[1] The differentiation of the fauna at this place is strongly marked. The three species of Pachyphyllum[2] which occur at Hackberry and Rockford, are here replaced by a new species of this genus.

[1] For a detailed description of the Rockford Shales, and the limestone which immediately underlie them, reference may be made to a paper by the author, on "Contributions to the Knowledge of the Devonian Fauna of Iowa, with a Description of the Rockford Shales," now in press by the Davenport Academy of Science.

[2] In a paper, now in the hands of the printer, the author has described three new species of this genus.

The species *Cystiphyllum davidsonii*,[1] which occur here in considerable numbers, also entirely replace *Acervularia inequalis*, of other portions of these beds. The Stromatoporoid forms, which occur at other localities, are here replaced by a single, undetermined species of this genus. Specimens belonging to the following genera are also found here, but are not known to occur elsewhere in the shales. *Pleurotomaria, Saxonema, Syringopora, Alveolites, Gyroceras*, etc.

In connection with these, we have obtained large numbers of new, and described, species of Lamellibranchs, which do not occur (or if so, in small numbers) elsewhere in this formation.

But the chief interest attaches to a certain very large, and undetermined species of Trilobite, which occurs here, and entirely replaces all other species of crustaceans which are known to occur at Hackberry and Rockford. The occurrence of this species in these beds is a matter of considerable interest, from the fact that it is the first instance of the known occurrence of any of these forms in the Rockford shales and indeed, in any of the Devonian rocks of northern Iowa.

The great variation in the lithological and palæontological characters of the shales at this place, from those observed at an exposure one and one-fourth miles to the north, as well as those at Hackberry and Rockford, led us at first to doubt their equivalency. But subsequent collections showed a considerable number of typical Rockford shale species (as shown by the following list), which prove them to be equivalent to other portions of this formation, as observed at other localities. The following enumeration is that, of some of the typical shale forms occurring here.

Spirifera whitneyi, Spirifera hungerfordi, Atrypa hystrix, var. *planosulcata* Webster, *Strophodonta reversa, Strophodonta canace, Campophyllum nanum, Zaphrentis solida, Cystiphyllum mundulum*, and *Naticopsis gigantea*. Although the number of species represented is considerable, yet their occurrence in individual numbers are usually small.

Loxonema gigantea, n. sp.—Shell large, cylindrical, sloping rapidly from the blunt apex. Length of adult individual from ten to thirteen and one-half centimetres. Volutions from six to seven, rather strongly convex at or below the centre, the last one strongly inflated, very oblique. Suture strongly defined; aperture circular or nearly so; shell thick, surface marked by minute curved striæ. This species more closely resembles *L. robusta*, of Hall (15 Regents Report of New York, p. 52) than any other described species known to me. It differs, however, from that species in that the shell is larger, the apex more blunt, the greater obliquity of the volutions, and in their greatest convexity being at or below the centre. Position and locality, Rockford shales, Owens Grove (south exposure), Cerro Gordo county, Iowa.

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[1] This variety approaches more nearly the form from Alpena, Mich., than to those from any other portion of the Devonian rocks of Iowa. Only two specimens of this species have ever been obtained (so far as known to me) from any other portion of this formation.

Loxonema owenensis, n. sp.—Shell very large and robust, subconiform; spire rather rapidly ascending, apex blunt. Volutions eight to ten or more, very oblique, strongly inflated, most prominently so below the centre, rounded. Suture deeply channeled; shell from two mm. to six mm. in thickness; aperture subovate. Surface apparently smooth. The depth of the suture in this species is very much greater than the suture in either the foregoing or following species. Height of adult specimens from fourteen to sixteen and one-half centimetres; diameter of body volution from four to five centimetres. This is, we believe, the largest species of the genus yet described. Position and locality, Rockford shales, Owens Grove (south exposure), Iowa.

Loxonema crassum, n. sp.—Shell large, subconiform depressed, rapidly broadening from the blunt apex. Volutions from five to seven, slightly flattened or broadly rounded; suture strongly channeled below; shell very thick; surface apparently smooth; aperture ovate. This species differs from *L. gigantea* in its more robust, depressed form, and the less convexity and obliquity of its volutions. Position and locality, Rockford Shales, Owens Grove (south exposure), Iowa. Quite a large number of specimens of each of the species described have been secured, and their specific differences are shown to be constant and well marked.—*Clement L. Webster, Charles City, Iowa.*

SOME EXTINCT SCLERODERMS.—In 1887, in the *Memorie della Societa Italiana delle Scienze* of Naples (3d series, v. 6, No. 4),[1] Baron Achille de Zigno has published descriptions and illustrations of two very interesting Scleroderms from the Eocene beds of Italy. One of these is the *Protobalistum imperiale* of Massalongo, the other a previously unknown species considered to be congeneric with the former and named *Protobalistum Omboni;* both were obtained from the celebrated Mount Bolca beds. The most casual examination will convince one who has had much experience with recent fishes that the two species have little in common and belong to very different genera if not families. Both are, however, important for the light they may throw on the genetic relations and former distribution of the Scleroderms, but each owes its importance to a different reason.

The generic description of *Protobalistum* given by Baron de Zigno is based on the assumption that there are certain characters which are common to the two forms, which does not appear to be justified by the specimens; on the development of 4 to 6 dorsal spines, of spinous rays to each pectoral ("pectorales radiis duobus spinosis"), and of 1 to 3 spines to each ventral ("ventrales radiis 1—3 spinosis, retro-flexis"). Such features as the last two are so incompatible with the structure of living Scleroderms that the suspicion is unavoidable that their ascription to the extinct forms is due to some error of observation or interpretation. The principal feature described and corroborated by the illustrations is the number of dorsal spines. The arrangement of the spines is nevertheless very different in the two species.

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[1] Duc nuovi pesci fossile della famiglia dei Balistini scopertinel terreno eoceno del Veronese. (8 pp., 2 pl.)

The typical *Protobalistum* (*P. imperiale*) has six (or seven) dorsal spines, rather widely separate from each other, extending from over the eye far back upon the posterior half of the body, and very elongate (the foremost especially); the soft dorsal as well as anal are very short. No pectorals and ventrals are represented in the figure, although it is asserted that there is a ventral spine.[1] The character of the dorsal fin is very different from that exemplified in any of the Balistids or Triacanthids. None of the Balistids have more than three dorsal spines, and all having that number have the second close behind the first, and modified to lock it in erection, in such a manner as to have obtained for the species the name Trigger-fish. The *Protobalistum* should therefore be apparently considered as the type of a peculiar family with generalized characters and allied to the progenitors of the Siganids and Teuthidids; the family name in such case would of course be *Protobalistidæ.*

The so-called new *Protobalistum* (*P. Omboni*) has four dorsal spines moderately approximated and confined to the forward part of the back; the first spine is very strong and the others very short; the soft dorsal is elongated, and the anal is oblong; the caudal peduncle is long. In fact, the species has the physiognomy as well as the structural characteristics (so far as known) of the Triacanthids, and there appears to be no reason for doubt that it belongs to that family, and that it is related to the genera *Triacanthodes* and *Hollardia,* with which it agrees in the convex caudal fin, and perhaps the development of one or two axillar rays, besides the elongated ventral spines. ("Le ventrali sono constituite da tre soli raggi spinosi rivolti all' indietro e addentellati nei loro margini, di cui il primo e lungo 27 millimetri, il secondo 25 el il terzo 20, e cadauno alla base ha il diametro di 2 millimetri.") The caudal fin is very large, and has a convex posterior margin, thus differing from that developed in the Triacanthinæ. No generic name being available for the fossil, it may be named *Protacanthodes Omboni*, the name recalling that the foremost elements of the spinous dorsal as well as ventrals are enlarged spines, as well as that it is a forerunner of the Triacanthids. It differs from *Hollardia* and *Triacanthodes* in the oblong caudal peduncle and enlarged caudal fin while its physiognomy rather recalls the true *Triacanthi*. The occurrence of a form so closely related to the *Triacanthodes* of the Japanese sea, and to the *Hollardia* of the Caribbean in the eocene seas of Europe, is worthy of special note, and this is a sufficient reason for the present communication.

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[1] Delle pettorali non si scorge sull 'esemplare alcuna traccia e delle ventrale si vede soltanto un solo raggio spinoso lungo tre centimetri ripiegato all 'indientro lungo il ventre (p. 4).

The nearest extinct associate of *Protacanthodes* is not *Protobalistum* but *Acanthopleurus* Ag. The two belong to the same family but appear to be otherwise distantly related. The other extinct genera of Scleroderms, *Balistomorphus* Gill, *Acanthoderma* Ag. 1843, not Cantraine, 1835, and *Bucklandium* Koenig—*Glyptocephalus* Ag.) are rather to be associated with the Balistids.

The exact characters and relations of all these fishes remain to be known.—*Theo. Gill.*

THE PHYLOGENY OF THE HORSES.[1]—This brochure of 71 pages, illustrated by two excellent plates, cannot fail to instruct the student who is unfamiliar with this subject. The authoress shows a great degree of familiarity with the history of the facts known in this connection and they are set forth with considerable fulness of detail. She has been more fortunate than some of her predecessors in avoiding record *in extenso* of the mythology of the subject, which has been long since consigned to its place in the waste-basket by American palæontologists. We allude to the Eohippus, Miohippus, and Pliohippus, which still appear occasionally in theological works and school-books of America and England. A considerable part of the essay is devoted to the endeavor to prove that the genera Palæotherium and Hippotherium must be excluded from the line of descent, which has continued from *Protogonia puercensis* through Phenacodus, Hyracotherium, etc., to Equus. She describes and figures with much care certain bones of the carpus and tarsus of Anchitherium, Hippotherium, and Equus, in evidence of this position as regards Hippotherium. We say with reference to this question, that in discussing the phylogeny of *genera*, one must confine himself to *generic characters*, and it is necessary to ascertain what these are in the skeleton before we can use them properly. There are some species of supposed Hippotherium of North America which approach Equus so closely in dental characters that the descent of some species of the latter from them looks probable. Probably the species of Equus are polyphyletic,[2] some coming from

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[1] Etudes sur l'Histoire Palæontologique des Ongulés, II, le Developpement des Equidæ. Par Marie Pavlow. Moscow, 1888.

[2] I have expressed this opinion in an article on the Perissodactyla in American Naturalist, 1887, p. 1075.

Hippidium and some from Hippotherium through the intermediate form with the molar teeth of the latter genus, and the single metapodials of the former. This genus has not been named, and I will now call it *Hippodactylus,* and give as the type *Hippotherium antelopinum* of Falconer from the Sivalik formation of India. It enters the Equidæ.

We find in this essay two new family names, whose introduction we regret. One of these is the "Hyracotheriidæ," which is perhaps a misapprehension of my own Hyracotheriinæ. This group cannot be separated as a family from the Lophiodontidæ so far as I can see. The other family name is Pachynolophidæ. Pachynolophus was based by Pomel on the *P. duvali,* which is an undoubted member of the family Lophiodontidæ, if the figure of Pictet (Traité de Palæontologie) is correct, and I believe it to be so after examination of specimens in Paris. But Lydekker and Pavlow place in this genus the *Hyracotherium siderotilicum* Pictet, an animal which is not only no Pachynolophus, but is not even a member of the Lophiodontidæ. Supposing its digits to be 4–3, it will enter the Menodontidæ, where I have placed it,[1] making it the type of the genus Acoëssus. How many of the species referred to Pachynolophus belong to Acoëssus I do not know, but in any case neither genus is a type of a separate family.

A further acquaintance with the American literature would have saved some minor errors. Thus it is stated that the limbs of Protohippus have not been described. They were described by me in 1873 (Annual Report U. S. Geolog. Survey Terr.), and were figured by Wortman in the *Revue Scientifique,* 1883, p. 712, from my blocks. The ancestral relation of Phenacodus to the Diplarthrous ungulate series, is ascribed to Wortman; but this view was published by the present writer long before that gentleman. The synonym Orotherium is ascribed to Cope instead of to Marsh. Merychippus is not different from Protohippus.—*E. D. Cope.*

HAYDEN MEMORIAL GEOLOGICAL FUND.—Mrs. Emma W. Hayden has given in trust to the Academy of Natural Sciences of Philadelphia the sum of $2,500, to be known as the Hayden Memorial Geological Fund, in commemoration of her husband, the late Professor Ferdinand V. Hayden, LL.D. According to the terms of the trust, a bronze medal and the balance of the interest arising from the fund are to be awarded annually for the best publication, exploration, discovery or research in the sciences of geology and palæontology, or in such particular branches thereof as may be designated. The award and all matters connected therewith are to be determined by a committee to be selected in an appropriate manner by the Academy. The recognition is not to be confined to American naturalists.

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[1] Classification of the Perissodactyla. Proceedings Amer. Philosophical Society, 1881.

GEOLOGICAL NEWS. — PERMIAN, TRIAS, ETC. — La Marmora, in his famous "Voyage in Sardinia," states that the Permian Triassic and even Liassic rocks seem to be entirely lacking in Sardinia. True Triassic beds, however, have been found in the southwest near Iglesias, while in the north of the island, near Nurra, Permian and Triassic strata occur. Descriptions of these rocks, with lists of their characteristic fossils, may be found in Bulletin XII. (2d series, vol. 11) and Bulletin XV. (2d series, vol. 5) of the *Comitato geologico d'Italia.*

JURASSIC. — The result of the researches of M. L. Dollo into the structure of the Iguanodontidæ is to prove that Iguanodon cannot be descended from Hypsilophodon or *vice versa,* but that they are the types of two utterly distinct families.

According to Dr. J. V. Deichmüller, the number of specimens from the lithographic slates now in the Dresden Museum reaches 1680, comprising 114 genera and 193 species, and including 48 species of fishes, 53 of insects, 48 of crustacea, and 21 of cephalopoda. Among the insects nine forms belong to the Orthoptera, seventeen, besides several still unidentified, to the Neuroptera, six to the Hemiptera, and eighteen to the Coleoptera. Of the Neuroptera two specimens only are *Neuroptera vera,* while the Termitina are represented by two, and the Ephemeridæ by one species. The remaining pseudo-neuropterous forms, comprising more than one-third of all the insect specimens, and nearly 95 per cent. of the neuropterous remains, belong to the Odonata. In his "Die Insecten aus dem lithographischen Schiefer im Dresdener Museum" (1886) Dr. Deichmüller not only gives fuller descriptions of previously known forms, but describes two new species of Locustidæ, one of Notonectidæ and one each of Carabidæ, Hydrophilidæ, Scarabæidæ, Buprestidæ, Elateridæ, Pyrrochroidæ, and Chrysomelidæ.

CÆNOZOIC. — M. L. Dollo, in his "Première note sur les Chéloniens oligocènes et néogenes de La Belgique," reviews the numerous remains of turtles belonging to the group Athecæ, of which Sphargis is the only existing representative, that has been found in the upper tertiary deposits of Belgium. Remains from the "Rupelian" clay (middle oligocene) were described by P. J. Van Beneden in 1883, under the title of *Sphargis rupeliensis,* while others from the "Bolderien" were by the same palæontologist named *Macrochelys scaldii.* The discovery of additional material has enabled M. Dollo to ascertain that the *Sphargis rupeliensis* of M. Van Beneden differs from the recent form by the presence of a continuous bony ventral armor, formed of a mosaic of small plates, while *S. coriacea* has only longitudinal series of isolated tubercles; by the slighter convexity of the carapace; by the absence of projecting dentellated ridges upon the carapace; by the margin of the dorsal armor not being rolled downwards; by the greater thickness of the carapace; by the apparent presence of horny plates; and by a skull proportionately shorter, wider, and with thicker bones. The cretaceous genera of the group Athecæ, viz., Protostega and Protosphargis, were without a dorsal armor. M. L. Dollo concludes that all the fossil Athecæ yet found in the tertiary strata must be referred to the genus Psephophorus, and distinguishes four species: *P. polygonus* H. von Meyer; *P. pseudostracion* P. Gervais; *P. scaldii* P. J. Van Beneden; and *P. rupeliensis* P. J. Van Beneden.

From the careful researches of Prof. Scalabrini, supported by those of Dr. Doering and Ameghino, it is now thoroughly established that the sedimentary formations of the Argentine Republic present all the series of Tertiary strata from the eocene to the modern. The Patagonian formation includes three distinct horizons: the lowest eocene, of marine origin, is characterized by *Ostrea ferrarisi;* the middle corresponds to the lower oligocene, is of terrestrial or fresh-water origin and encloses bones of mammals, turtles, crocodiles, and fresh-water fishes; while the upper, of marine origin, characterized by *Ostrea patagonica*, represents the upper oligocene. The earlier conclusions of Darwin and D'Orbigny are thus confirmed, and Burmeister's later affirmations disproved. The remains referred to by Bravard to the Old World genera Anoplotherium and Palæotherium have been demonstrated by Ameghino to belong to two new genera peculiar to the New World, and are by him entitled Scalabrinitherium and Brachytherium, while a third genus near the former takes the name of Oxyodontherium.

M. Larrazet, as the result of his studies upon the character of the skin among fossil rays, divides them into three types: the first approximating to the modern Raja in form and size; the second, which has placoid ossifications with a broad base and small spine, forming the genus Dynatobatis; while the third, the dermal ossifications of which have a long spine and small base, forms the genus Acanthobatis.

PLIOCENE AND PLEISTOCENE. — M. A. Villott thus classifies the alluvial deposits of Dauphinè: (1) Those of the high plateaus, some of which occur at a height of 700 metres above sea level, and which may be referred to tertiary times; (2) The pre-glacial deposits of the lower plateaus, forming the upper part of the high terraces, and entirely belonging to the quaternary epoch; (3) The post-glacial alluvium of the lower terraces, formed after that great extension of the quaternary glaciers. The erosion of the valleys is referred principally to three different periods: (a) that which preceded the quaternary epoch, and was the result of the bursting of the pliocene lakes — a necessary result of the last elevation of the

Alps; (b) that which occurred during the glacial period; (c) that which is the work of the modern epoch.

Four years ago M. G. Rolland announced his belief that the great fresh-water formations of the Sahara are much less recent than had been hitherto believed, the greater portion of them belonging to the pliocene instead of the quaternary age. Subsequent studies of these deposits have confirmed his first opinion, of which he has now found palæontological proof by the discovery of a number of casts of species of Helix belonging to the group of *H. tissoti* and *semperina*, which characterize the lower pliocene of Biskra and Constantine. M. Rolland also shows the synchronism which exists between the different beds of the Eastern Sahara and the corresponding fresh-water beds of the pliocene and quaternary formations in the Atlas region.

MINERALOGY AND PETROGRAPHY.[1]

PETROGRAPHICAL NEWS.—Among the rocks gathered by Reyer[2] during a journey through the Sierra Nevada Mountains, Schuster[3] has found the following principal types: biotite granites, containing microcline and pilitized biotite; saussurite-diorite and quartz-diorite, containing orthoclase; saussurite, pilite, and biotite gabbros; quartz-porphyrites, kersantites, andesites, serpentine, fragmental rocks, and tufas. Although the paper in which these rocks are described consists merely of detailed descriptions of detached rock-specimens, it nevertheless contains many points of considerable interest. Pyrophyllite is mentioned as an alteration product of olivine and of plagioclase; reaction rims around augite and olivine are pictured; intergrowths of biotite and augite, of biotite and hornblende, and the alteration of biotite into pilite and into hornblende, are each described. Chromium mica is mentioned as occurring in a magnesite concretion in serpentine; helminth, as a constituent of a diabase porphyrite, and anorthoclase, as existing in a hornblende porphyrite. A most interesting case of intergrowth is that in which a long, tabular crystal of plagioclase penetrates diallage in such a way that its long edges are parallel to the orthopinacoid of the augite, and its twining lamellæ are parallel to the lines of inclusions in this mineral. Indications of the effects of pressure were seen in a large number of the sections examined.——Dr. Wadsworth[4] has recently published a report embracing preliminary descriptions of the peridotites, gabbros, diabases, and other rocks of

[1] Edited by Dr. W. S. Bayley, Colby University, Waterville, Me.

[2] Neues Jahrb. f. Minn., etc. Beil. Bd. v., p. 451.

[3] Ib., Beil. Bd. iv., p. 291.

[4] Geolog. and Nat. Hist. Survey of Minnesota, Bulletin No. 2. Minneapolis, 1887.